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ABSTRACT

This study attempted to determine if 3-year-old low socioeconomic status children possessed a generalizable concept of circle/round, and examined two methods of teaching to those children who did not already possess it. Twenty 3-year-old children were first presented with training sets consisting of 12 pairs of stimuli: six pairs of objects emphasizing the sphere (three-dimensional) and six pairs of color photographs of the same objects emphasizing the circle or round (two-dimensional). Following each of these training sets, 10 test trials were administered. One errorless set of responses defined the criterion for all training series. Results indicate that among disadvantaged 3-year-old children there exists a fairly strong and generalizable concept of round/circle/sphere. Data also show that most of the errors on the test trials occurred on the two-dimensional series, suggesting that the strength of the learning on the two-dimensional series was not the same as that for the three-dimensional series. In the second study, the six children who did not possess the concept by the above criteria were randomly assigned to one of two treatment groups. The first (standard) group emphasized the use of two-dimensional materials; the second (experimental) group emphasized the child's active involvement with spheres and other three-dimensional objects in addition to some procedures employed with the first group. Results indicate an effect slightly in favor of the experimental group, though it is suggested that more definitive conclusions will require more children and a more complex design. A 20-page appendix consists of the instructional materials used in the second study. (SB)

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THE DEVELOPMENT AND ACQUISITION OF THE ABSTRACT CONCEPT ROUNDNESS

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As anyone who even casually reads the psychological literature realizes, there has been a dramatic shift in theoretical interest from mechanistic to organismic theories. As a consequence more emphasis has been placed on describing how the child comes to know about his world rather than on the acquisition of specific behaviors. A major impetus for this work has been a renewed interest in Piaget (1947) (enhanced by the clear description of Piaget's work produced by Flavell, 1963) and the more recent work of Bruner (1964) and Neisser (1966). As one surveys the output of all this productivity, it would seem appropriate to conclude that a considerable amount of new and important knowledge has been gained about the course of normal perceptual and cognitive development. This latter statement is probably more accurate when it is restricted to work using infants and children between the ages of five years and ten years. Relatively little work has been performed on children in the so-called toddler stage (age two and three years) presumably because of their relative lack of availability and because it is unclear conceptually what it is that is occurring or how what is occurring can be conceptualized. One of the problems is to ask the appropriate question with respect to what it is that the child may be acquiring during this period which is essentially described as a stage of "consolodation"; that is, the child has already achieved sensori-motor intelligence and is applying this knowledge to his environment. He is said to be in the state of "pre-concrete operations". During this period, however, it must be that the child's thought processes are beginning to move from sensori-motor actions to a new level of abstraction or representation. In effect, the child initiates the use of symbols (signifiers) that relate to objects or actions that heretofore had to be physically present and acted upon. These abstractions, it should be noted, do <u>not</u> necessarily rely on, or occur because of, the onset of language. They are, in effect, cognitive

representations that can be expressed through imitative and play behaviors. This point is made very clear by Piaget for whom language is a means of symbolizing actions and events but is not the symbol system per se. He argues that symbolic actions, as incorporated in certain types of imitative and playful behaviors, in fact precede language (see Hunt, 1961, pp. 175-176 for a detailed discussion). During this phase of development, then, there are emerging abstract capabilities involving representations, imagery, and symbolic manipulations. These newly acquired competencies (structures) are most likely to emergy behaviorally in terms of imitative and play behaviors and to a lesser extent in the child's language.

Of particular relevance fo the planninf of toddler programs, is the emphasis given by cognitive theorists to "play", particularly symbolic play. Although play continues to involve substantial components of motoric action, careful observation indicates that increasingly during the toddler period the features of play include representations. Thus a pencil can represent a truck or an airplane to which the child applies appropriate actions. The toddler also begins to apply past experiences to new ones, although not always appropriately, indicating that the child is thinking, at least in some primitive sense. An interesting characteristic of p play behavior is the often incredible repetitiveness of it; that is, the child repeats a set of actions over and over apparently in an effort to master the particular skills involved. (It might be noted that this behavioral characteristic is not solely restricted to the toddler stage but, in fact, can be observed at later age levels.) Despite the phenomenal growth in symbolic development, there remain a set of characteristics that reduce cognitive performance at this stage to relative immaturity. First, the toddlers thinking or abstractions are, in fact, relatively concrete or lacking in generality. In effect the child has not formed recognizable concepts so that objects cannot be classified in terms of similarities. Secondly, the child's mental activities are largely egocentric; that is, his thinking is largely in terms of his own needs.

Empathic behavior, for example, is unlikely because the child is unable to mentally place himself in the situation of another. This interesting aspect of the child's behavior is relfected in his question-asking behavior, particularly about physical causality. Rather than reflecting a request for a causal (factual) explanation, the child is apparently much more concerned about his relationship to the particular event. For example, the toddler may accept the notion that there is snow on the ground because he wants to go skiing. It should be made explicitly clear that this characteristic of the toddlers' behavior is cognitive and not a personality characteristic in the usual sense of the term egocentricity. And, finally, the toddler is apt to distort reality to conform to his own desires.

Although this account of theoretical aspects of the toddlers' cognitive development is very general and lacking detail, it should be apparent that during this age period there is the emergence of symbolic behavior. Specifically, the child is moving away from purely sensori-motor actions to increasingly greater reliance on symbolic or representational modes of behavior that rely less and less on actions. It is also clear that an important mode for expressing and for developing symbolic competency is through play and imitation -- modes which are particularly adaptive to the more formalized settings in which groups of toddlers are likely to be found. (A very fine example of the work that can be done with toddlers can be found in Sigel, 1972). Theoretical considerations clearly indicate that toddler age children should be strongly encouraged to engage in symbolic play and that materials and instructional programs should be developed to foster such activities.

2. Language Acquisition Theories

There are two broad categories of language acquisition theories -- behavioral and innate. In a very real sense, however, these basic formulations are not genuinely developmental. In the case of behaviorism, the child is seen as acquiring language through a process of imitation, selective reinforcement, and generalization. The only sense in which this position can be perceived as developmental is that

increasing age provides more opportunities for S-R associations to occur but there is no necessity for involving special principles that are age related. Innate theories postulate a built-in mechanism (the language acquisition device, LAD) which reduces the potentially infinite number of linguisitc rules to a manageable number. The LAD is available and functional as an innate given and in that sense is not developmental. Innate theory is developmental only in the sense that it postulates invariant stages of language acquisition but these stages are predetermined and not specifically related to developmental concepts (Lenneberg, 1967). The main issue involves the relationship between language and thought where it is assumed that language follows the formation of cognitive structures (Bloom, 1970).

The theoretical position which appears to make most sense assumes that the mechanisms for acquiring linguistic competence are in fact innate, that the stages of linguistic competence are invariant and that an important attribute in language acquisition involves semantics or meaning.

The assumption of innateness is crucial in order to account for both the fact of language and for the ability of children to rapidly acquire the necessary set of rules which permits them to functionally use their language. It is the latter use of the term innate which is important and should be clearly understood. First, consider the fact that although all languages share some common syntactical features, they also involve numerous specific rules. Theoretically at least there could be an infinite number of syntactical rules and presumably the human organism possesses the capability for using any combination of this hypothetical set of infinite rules. Exposure to a specific set of linguistic rules is a necessary condition for their acquisition. Simply stated, the assumption of innateness is concerned primarily with the ability to acquire the rules of a linguistic system and to generate sentences based on those rules.

The second assumption (invariant sequences) follows from the first and is similar to Piaget's views. Initially, the child employs two word sentences which incor-

porate many grammatical features albeit at a quite unsophisticated level. But in order to comprehend the grammatical features one must be aware of the context in which they occur so that meaning can be attributed to the words. Mostly, however, these early utterances are action oriented and reflect, as noted earlier, the child's knowledge (cognitions) of the world. (A good example of this is reflected in the child's achievement of object permanence.) As the child's awareness of the world develops there is a concomitant increase in the length and complexity of the sentences he uses. There is probably not a one-to-one mapping of cognitive and linguistic structures but rather a grouping of cognitive structures which are reflected by common linguistic features. During the toddler period there will also emerge the use of negations and inflections. Indeed there is some evidence to suggest that between two and four years the toddler will master almost all the features of adult language (Berko, 1958).

The crucial issue for the formation of toddler programs is to understand the relationship between language and cognitive development. Specifically, language should not be viewed as a behavior that develops or functions independent of cognition but rather as a reflection of the child's continuing mastery of his environment. Thus, according to this view, specific language training designed to improve the quality of the child's language, is apt to have little lasting consequence if the required cognitive structures are not available. Emphasis should be placed on the formation of cognitive structures.

3. Memory

Memory as an aspect of cognitive development has been largely ignored with respect to the toddler age group both in terms of theory and research. This state of affairs certainly cannot be interpreted as meaning that memory processes are nonexistent in the toddler age group, but, rather, methods for accurately assessing memory have not been developed. Furthermore, by inference at least, memory during the toddler period is probably at such a primitive stage as to not be of much inter-

est to scientists. Specifically, Flavell, Beach and Chinsky (1966) have shown that memory is improved by the use of spontaneously produced systems of coding input; systems that apparently are not routinely produced among preschool children. Thus what is probably available to the toddler is some kind of primitive imagery that permits recall of missing objects or perhaps recall of two numbers or two familiar words. It is not until the child is able to produce concepts that coding will aid in recall. The reader should recognize that most of the statements suggesting that toddler memory is primitive are based largely on conjecture. Empirical tests are needed but will require the development of new procedures.

The original programmatic plan for working with toddler-age children called for a systematic assessment of the concepts that the children possessed. It was planned to begin with such simple concepts as circle/round, square/cube, and move progressively toward less perceptual attributes and towards more abstract and verbal concepts. These plans were modified when it became clear that priorities of the funding agency had changed and that this general programmatic effort was no longer considered of high priority. The work that was completed involved an assessment procedure for determining the possession of the concept circle/round and a preliminary procedure for teaching the concept to children who did not already possess it. It has been assumed that there would have been an age by concept difficulty interaction so it was planned to use three and four-year-old children sampled from both the lower-and middle-class. Our experience with middle-class children indicated that they also possessed the concept. Therefore, this study is based entirely on a sample of three-year-old lower-class children.

One of the first methodological problems was to develop a procedure that would signify the possession of a concept and not merely the ability to discriminate forms. It did not seem feasible to ask the children about the nature of the stimuli because of their generally poor verbal skills which could have had the effect of underestimating

the number of children possessing the concept. It was finally decided to use the principle of "stimulus generalization"; that is, to present the children with increasingly more difficult discriminations but where the discriminiative feature was obvious. A second technique that was employed was to determine if the children could continue to cope with the discriminations in two dimensions rather than the three dimensional forms which were initially used. This technique, as extensive research literature has shown, worked extremely well.

Purpose of the Study.

Concepts refer to some more or less abstract features included in a class of stimuli. At a primitive level perceptual properties (form, color, size) probably provide the basis for initial categorization of stimuli. At a more sophisticated level (a level more removed from the direct stimulus properties) the child forms concepts on the basis of functional properties (Meyer, 1972). Finally, the child becomes able to classify stimuli in terms of generic categories. Thus, the developmental sequence involves the successive differentiation from a global overgeneralized concept to a more discrete and bounded concept (Werner, 1957).

Existing research and theory is not particularly helpful in answering questions about the acquisition of these concepts. Kessen (1962), for example, has pointed out that although Piaget very adequately describes concept acquisition, he does not spell out the rules of transition from one stage to another. Earlier studies (see Thompson, 1962, for a description of these studies) did not use adequate samples or analyses so that their data are, at best, tentative. More recent studies of discrimination learning (See Reese and Lipsitt, 1970, for a review of this literature) are more concerned with theoretical variables derived from learning theory than with concept formation. Furthermore, these studies often fail to provide sufficient variation of stimulus characteristics to permit conclusions about "concepts". Thus the purpose of this study is to examine three-year-old children, of lower-class origin,

to determine if they possess a generalizable concept of circle/round. The study is also concerned with testing a pilot procedure for teaching the concept to those children who did possess it at the time of initial testing. The teaching procedures examined the efficacy of using purely "verbal" techniques with children of this age as opposed to manipulative and verbal procedures.

The Assessment Procedure

METHOD

Subjects A total of twenty subjects were employed in the study all of whom were from a lower-class socio-economic environment. It was not possible to obtain all the subjects from the Syracuse University Day Care Center because there were too few three-year-old children. Thus, from the total sample of 20, 12 of the children came from the University Day Care facility and the remaining children came from a locally operated day care facility for lower-class children. It is, of course, impossible to demonstrate total comparability; the eight "outside" children were from the same neighborhood as the Center children and would have been eligible for that program. Of greater importance, however, is the fact that the Center children had become accustomed to varieties of people around and in responding to their questions -- they were probably more test-wise than most other children. In an effort to overcome this real problem, the Examiners spent two hours per day for three weeks interacting in various ways with these eight children. That the procedure may have been successful is shown by the fact that roughly the same proportion of children in both groups were able to successfully cope with the demands of the study. The children ranged in age from 3-4 to 3-11; the mean age was 3-7, SD = .83. There were an equal number of males and females. We did not have IQ or other aptitude data on these children but based on our experience with the current sample of four-year-old children (they had been in the program last year) it seems safe to assume that they are of low-average (mid 90's) ability.

Procedure There were several methodological problems that needed to be solved in order for the data to make at least some sense. The original plan had called for the use of the Wisconsin General Testing Apparatus in presenting the stimuli. This proved impossible because of restricted funds. Earlier work by Meyer and Seidman (1961) indicated that meaningful data could be developed by using a plywood blind while arranging the stimuli and that the use of the verbal statements "Right" and "Wrong" were as effective as material reinforcers. The portable blind was used but it was decided to use a combination of M & Ms and the verbal statement "Wrong" because of the indications in the literature that material reinforcers, such as candy, were more effective than verbal reinforcers with lower-class children. Thus, for each correct response the child was given an M&M which was placed in a cup and accumulated for later consumption.

The second problem was the development of the range of stimuli to be used for testing the generalizability of the concept. An exhaustive search of the literature indicated that Long (1940) had also been interested in the concept of roundness and had developed a rather extensive set of stimulus pairs which seemed to meet the needs of this study. Although Long did not explicitly state the rationale for his stimulus series, it appears to follow something of a developmental sequence. The first series of stimuli involve a perfect sphere compared against a variety of other stimuli (cubes, prisms, etc.) where size and color (of both the stimuli and the background) are allowed to vary. This series seems most simple in that all the child needs to learn is to approach the positive stimulus (sphere), which is in randomized positions, and avoid all other stimuli. One could not, however, make a strong case for concept acquisition on the basis of those data. Within the initial series, positive stimuli are gradually changed from a perfect sphere to some slight variation such as an orange. Then the stimuli are further modified, and in a real sense the focus of the positive stimulus is changed so that greater emphasis is given to circularity as opposed to

sphericality. For example, in a pair involving a ball and a cup, the ball is correct but, note, the cup has a "round" aspect to it. But, in the pair "cup" and "cube", the cup is correct because it incorporates the property "round". In this case, then, an a priori case can be made that the round cue can be viewed as more difficult and also as a generalization of the sphere. The final series is essentially a repetition of the foregoing stimulus pairs except in two dimensions. IN this case the stimuli can be viewed as representations of the real object and therefore requiring some form of cognitive transformation. It is also probably the case that two dimensional stimuli provide fewer perceptual cues and are therefore more difficult to discriminate. It does seem logical though that if a child can cope with all of the stimulus pairs, he has a reasonably complete concept of roundness.

Long's procedure involved a lengthy series of training trials requiring the children to attain a level of ten consecutively correct responses. Following the training trials there was a series of 15 test trials involving all possible variations of size, color, and form. These test trials were not reinforced.

Although the procedure used by Long seems most desirable, it did seem to be too long. Inspection of his data indicated that it was possible to reliably establish child's possession of the concept with fewer training trials. It also seemed unnecessary to use 138 trials to determine children's ability to perform with the two dimensional stimuli. Indeed, the entire procedure was of such length that it required three days to administer and there are hints that there were severe motivational problems with the younger children. In view of these potential problesm, the procedure was shortened by requiring the children to attain criterion training pairs representing sphere and circle, in one series, and with two dimensional training pairs. It was felt that this procedure had the advantage of providing the children with the breadth of stimuli but not length or repetitiveness. The final sets were comprised of 12 pairs of three-dimensional stimuli and 12 pairs of two-dimensional stimuli. The

training sets consisted of 6 pairs emphasizing the sphere and six pairs emphasizing the circle or round. Following each training set, 10 test trials were administered. All of these responses were reinforced. A criterion of one perfect (errorless) set of responses defined criterion for all training series. It was possible to complete the entire series with all of the children in no more than 1 and 1/2 hours, with the mean time being 50 minutes. In all cases two sessions were employed, with the first session consisting of 30 minutes. The following stimulus pairs were employed:

1. red rubber ball vs natural wooden rectangle
2. white rubber golf ball vs white paper drinking cup
3. White and red striped marble vs natural wooden rectangle
4. orange vs drinking cup
5. small red wooden ball vs small green wooden cube
6. small green wooden ball vs small green wooden cube
7. natural wooden disc vs white rectangular paper box
8. red circular sponge vs white rectangular sponge
9. black perforated typewriter ribbon-holder vs rectangular match box
10. natural wooden circular peg vs yellow wooden rectangular pencil
11. circular roll of yellow paper vs rectangular glass lid
12. circular glass bottle vs rectangular glass bottle

TEST TRIALS

1. large red wooden ball vs small red wooden cube
2. large green wooden ball vs small red wooden cube
3. small red wooden ball vs large wooden cube
4. small red wooden ball vs large green wooden cube
5. large green wooden ball vs small red wooden cube
6. circular ash tray vs rectangular ash tray
7. multi-color coffee cup vs red rectangular box

8. green circular sponge vs red rectangular sponge

9. orange wooden disc vs blue rectangular pencil

10. red circle on blue background vs blue triangle on red background (these stimuli are two-dimensional)

Training for two-dimensional compentency for the concept circle was achieved by using color photographs of the stimuli employed in the first phase of the training. Thus there were again 12 training stimuli and 10 test stimuli. It should be noted that in both sets of training stimuli, and for the test stimuli, random orders of presentations were employed over subjects and the position of the correct stimulus was determined by using a Gellerman series.

RESULTS

Little or no difficulty was encountered in working with the children; they readily understood the directions and found the M & M incentives very attractive. As a consequence none of the original subjects selected were lost. It should be noted, however, that it has been the author's experience that without establishing a relationship with the children well beforehand, the children do not cooperate nearly as well as they did in this study. Such elaborate procedures are generally not required when working with middle-class children of similar age.

It should be recalled that the purpose of this phase of the study was to identify the frequency with which children from a lower-class SES who are three-years old possess the concept round/circle/sphere and the degree to which the concept generalizes. However, since there is an extensive literature with respect to children's rate of learning two choice simultaneous discriminations (sometimes referred to as concept learning), the initial analyses will be highly traditional to give the reader some idea of the difficulty of the task. Summarized in Table 1 are the means and Standard Deviations (SD) for each series (three-dimensional and two-dimensional) and for the test trials-to-criterion where the child had to make ten consecutive correct responses. The means include the 10 criterion trials. If a child had not achieved criterion at the end of

72 trials, he was terminated and given a score of 72 (this accounts for the rather large SDs). All the children, however, achieved criterion within the 72 trials.

An examination of the data in Table 1 suggest that the girls did somewhat better on the task than the boys and that the stimulus pairs comprising Series 1 were easier than those comprising Series 2. A straight forward ANOVA was run on the data with one variable between groups (sex) and one variable within groups (Series). The results of the analyses indicated that the sex difference is not statistically significant ($F = 1.3$, $df = 1,18$, $p = .10$). The Series effect was significant ($F = 4.7$; $df = 1, 18$, $p = .05$). The sex by Series interaction was not statistically significant ($F < 1$). These data show that the effect of training on three dimensional stimuli does not generalize as readily to two-dimensional stimuli as it does to altered forms of three-dimensional stimuli. This finding is entirely consistent with our hypothesis and indicates that young children probably require the extra cues derived from three-dimensional objects in learning to discriminate among them and to acquire concepts from their manipulation.

The data with respect to the test trials suggests the same results as those reported for the acquisition series. There was a problem in analyzing these data, however, because we elected to reinforce all responses made by the children regardless of their accuracy. A possible effect of this procedure was that the first response would influence all other responses in the sequence. Given this possibility, the data were analyzed in two ways: (1) the percent of correct responses on the first test trial was determined by summing over subjects treating each test series separately and then total number of correct responses for each test series were determined and an ANOVA with one variable between groups (sex) and one variable within groups (series) was computed. Only two children failed item one, Series 1, whereas four children missed the first item on Series 2. In effect, 90% of the children showed generalization of the three-dimensional test series and 80% on the two-dimensional test series. These data indicate

TABLE 1

Means and SDs of Trials-to-Criteria for Three-and Two-Dimensional Acquisition Stimuli and Test Stimuli

	ACQUISITION TRIALS			
	Three-Dimensional Pairs		Two-Dimensional Pairs	
	M	SD	M	SD
Males	34.1	21.6	47.9	24.8
Females	31.2	21.8	46.7	23.7
Total	32.6	22.3	47.3	24.3

	TEST TRIALS			
	Three-Dimensional Pairs		Two-Dimensional Pairs	
	M	SD	M	SD
Males	.92	.24	2.3	1.6
Females	.87	.18	1.9	1.3
Total	.89	.20	2.1	1.8

indicate that among disadvantaged three-year-old children there exists a fairly strong and generalizable concept of round/circle/sphere. This conclusion is further reinforced by the finding that out of a possible 400 test responses (20 children times 20 test items) only sixty errors were made; that is, the children responded correctly to 85% of the test items. The ANOVA resulted in an F of less than one for both sex and the sex x series interaction. As might be anticipated, the Series effect is statistically significant ($F = 7.5$; $df = 1, 18$; $p = .01$). Indeed, the data clearly show that most of the errors on the test trials occurred on the two-dimensional series suggesting that the strength of the learning on Series 2 was not, perhaps, the same as that for the three-dimensional series. Again, this result is not at all surprising in view of the fact that two-dimensional stimuli provide fewer cues and, from a cognitive-developmental view, two-dimensional stimuli are actually representations of the actual objects thus requiring an understanding of the relationship between pictures and actual objects. Based on the outcome of this evaluation procedure a total of 6 children were employed in the training task. These children are comprised of two children who did not reach criteria on the three-dimensional task and the four children who failed to attain criteria on the two-dimensional task (these children accounted for over 95% of the errors made on the combined test trials).

Before exploring the second phase of this study, the training program, some observations concerning the results of the screening procedure seem necessary. It would seem that there are two issues: (1) the procedure itself, and (2) the degree of subject variability. First, Long's procedure would appear to have been too cumbersome in the sense that all the training and test trials that he used were really not necessary. Our data indicate that it is possible to accurately determine a child's grasp of a concept with fewer training trials and with fewer test trials. The crucial feature of the procedure is the use of test trials and variable stimuli that encompass the concept to some degree; that is, the use of a discrimination learning paradigm to

determine the existence of a "concept" really requires a broad variety of "generalized" stimuli. For those critics who would say "why not ask the child" I can only respond that the procedure used in this study does permit quantification more readily though it is unclear whether the procedure necessarily produces more meaningful data.

The second issue is of more conceptual interest because it may say something about the nature of development. It will be noted that their was considerable variability in attaining criterion and that there was greater variability with Series 2, the more difficult of the two series. Clearly, these data indicate that children attain the concept at different points in time; there are vast individual differences. Thus there was a decided tendency for children who attained criterion rapidly, under 25 trials, on Series 1 were also successful on Series 2. Conversely, children who required more than the average number of trials on Series 1 required more trials on Series 2. This finding can be interpreted as showing that a child must successfully internalize a concept at one level before he can readily achieve the next higher level of the concept, in this case, comprehension of pictorial representations of the concept. If this is correct, and logically it would seem to be correct, then teachers should develop the habit of being certain at what level their children are functioning before beginning a lesson or defining instructional objectives for children. In defining the child's level of functioning, a broad variety of instances of the concept should be presented; testing for level of functioning should not be based solely on materials with which the child has had direct practice.

THE TRAINING STUDY

The general purpose of this study is to examine two methods of teaching six children the concept of circle/round under classroom conditions. Since there were so few children who did not possess the concept, it became necessary to radically modify the originally planned procedure of using a between-groups design and go to the more economical within-groups design. At this point, it became clear that there was an unresolvable problem of confounding method with order effects if the same

order was used for all subjects. However, six subjects did not seem like a sufficient number to use a counterbalanced design. Of the alternative solutions (obtaining additional subjects was not viable because of time and fiscal constraints) it seemed that counterbalancing made the best sense but clearly definitive conclusions will be impossible because of the sample size.

METHOD

Subjects The subjects used in this phase of the study have been previously described (see p.8). In addition to that information, the children were comprised of four boys and two girls and had a mean age of 3.7. Three of the children were from the Syracuse University Center and the remaining three were from the local Center. There seemed to be no way in which these children appeared to be different from the other children in the sample.

Procedure Subjects were randomly assigned to each treatment. The first treatment group can be considered the control or standard group in that it emphasizes the use of two-dimensional materials (matching-to-sample tasks, copying, and learning verbal labels). For the sake of convenience, this group will be called the Standard Group (SG). The Experimental Group (EG) involved a variety of tasks emphasizing the child's making spheres and other three-dimensional objects and pointing out differences, both verbally and motorically, between the different forms. In addition, the children were given kinesthetic experiences; making circles in the air with their hands, turning around, rolling. They were also given Tinker Toys and told to find those things that roll and those that do not and to describe, in their own words, the crucial properties of the rolling objects. A part of the EP included the paper-and-pencil procedures employed with the SG.

Each procedure was conducted for approximately six weeks. (In this connection, it is recognized that a great deal can happen developmentally in two months which would have made a control group useful. We did not have a control group.) Each group of

three children met twice a day for fiteen minutes or a total of 10 hours of experience within each program. The children's cooperation was excellent but it did become necessary to offer the children M & M candies during the latter part of the Standard Procedure to maintain attention. Another useful operation here would have been the use of observers to determine the degree to which each child was attending to the various aspects of the program -- in other words, was the program having equal effects on all the children. Examples of the lesson plans are presented in the Appendix to this report.

In order to test for the effects of each program, the children were given the two test series at the conclusion of each program. The series were given at two settings on the same day; they, in effect, replaced that day's lesson.

RESULTS

The results of the test trials are presented in Table 2 for each treatment and for each series. Since there were only three subjects in each treatment group it did not appear to make much sense to statistically analyze the data. In lieu of formal analyses, percent passing on each series before and after the treatments were examined along with differences percent passing on each series. The permissible inferences from such an approach are clearly limited.

Preliminary to running the test trials, a set of five stimulus pairs from the original learning series were presented in order to orient the children to the task. Correct responses were reinforced and incorrect responses were corrected, the child was asked to respond again, and this response was reinforced. The test trials followed the warm-up series without interruption or comment. Examination of the data indicate that the children who performed poorly on the three-dimensional test, on the first administration, performed much better. One child, for example, who scored 60% on the original test, obtained a score of 90% (one error), and all the other children showed marked improvement (note that four of the six children performed without error and

TABLE 2

Percent Items Passed on Test Trials Before and After Treatment for Three-and Two-Dimensional Stimuli

	Per Cent Correct			
	Pretraining Trials		Post Training Trials	
Subject #	3-D	2-D	3-D	2-D
1	60	50	90	90
2	40	20	80	40
3	70	40	100	60
4	70	30	100	50
5	70	10	100	40
6	80	30	100	60

the worst score was two errors.) There does not seem to be a difference in the effectiveness of the treatment procedures but then it should be recalled that the children performed reasonably well on this task before training so that treatment effects may not be discernible.

The performance data for the two-dimensional test are not nearly as strong as for the three-dimensional task though they do suggest that the treatment procedures had some positive effects. The range of performance was from 50% to 90% with the greatest improvement in performance occurring for the one child who was in the EP and had an entering score of 50%. Although there appears to be a treatment effect slightly in favor of the EP group, it may well be a function of the one child who gained four points on the ten-item task. More definitive conclusions will require more children, and a much more complex design.

DISCUSSION

There are numerous obvious difficulties in attempting to formulate some form of discussion with respect to a project that never really was carried through to its logical conclusion. As noted earlier, the plan used employed in this report was to be replicated using increasingly more complex concepts. The ultimate objective was to map the concepts available to three-year-old children and to determine if, or how, one might help children achieve those concepts seemingly required for further development. Unfortunately, the only concept we were able to examine was that of circle/round/sphere, a concept we believed at the outset, and eventually demonstrated, was readily available to most three-year-old children, even so-called "deprived children". Indeed, we selected this concept as the first one to examine because we were so certain that it would be easy for the children thus reducing the problems of motivation and therefore, allowing us to examine our procedures in their purest form. We were, in my judgment, successful in defining a meaningful and practical procedure for concept assessment.

There is one aspect of this study that can be discussed with considerable confidence even though direct data bearing on the issue were not reported. Recall, that for the Standard Group it became necessary to offer the children M & M candies for participating in the lesson. Note, the M & Ms were for responding, regardless of the quality of the response. This problem of motivation never arose in the Experimental Group; any observer could see clearly that the children enjoyed what they were doing. In fact, they became quite creative in developing motor tasks that exemplified "circle" and it was with those tasks that they truely participated in the session. It may be unheard of, but it was clearly possible to maintain the attention of these "disadvantaged" children for more than 15 minutes so long as we kept working on motor tasks. Admittedly, our success with the motor tasks did not transfer to the more symbolic aspects of our program. It is also the case that the motor-copy behavior did not transfer to any great degree to our two-dimensional test series. These negative results would seem to lead to a negative conclusion: programs for young children (up to 5-6 years) that solely emphasize two-dimensional materials will probably not be successful! Similar conclusions were suggested in earlier work of the author (Meyer, 1972) and that of many other investigators, I'm sure. One can only wonder why educational programs continue to employ two-dimensional stimuli?

A final note. In the introduction to this study it was noted that relatively few studies of toddlers have been reported in the literature. A variety of reasons were offered for this fact. In view of our work with three-year-old children, it would seem that the major reason is the difficulty in finding them; that is, as an institutional entity they don't exist. Perhaps, however, with the advent of day-care more work will be conducted with these children and we may learn more about how their conceptual and language development emerge and these attributes relate, or influence, social development. This seems like a worthwhile objective.

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APPENDIX A

The Instructional Materials

Problems Confronted in the Lessons (Standard Group)

1. Introducing the circle configuration through contrasting exercise involving many different kinds of shapes.
2. Reinforcing the recognition of the circle by providing experience in drawing around various geometric shapes.
3. Furthering knowledge of the circle configuration by matching a variety of geometric shapes.
4. Becoming more familiar with geometric shapes, especially the circle, by sorting and classifying them.
5. Increasing the orientation to geometric configurations, with emphasis on the circle, by duplicating a variety of shapes.

Experimental Group

1. Introducing the circle/round concept through a 35mm slide presentation and a creative collage building exercise.
2. Furthering the children's understanding and expanding their notion of circle/round by using tempera paint to establish original schema based on the circle.
3. Increasing the circle/round orientation through the showing of a movie and providing for the investigation of the relationship between physical body motions and the concept of circle/round.
4. Investigating the aspect of motion in the circle/round concept by the use of a movie and giving the children an opportunity to construct things that move on wheels with tinker toys.
5. Furthering the understanding of the circle/round concept through exposure to a printing experience which would utilize kinesthetic involvement by the children.

Standard Group

Lesson One: Introducing the circle configuration through a contrasting exercise involving many different kinds of shapes.

Objective: To become familiar with a variety of geometric shapes through a contrasting exercise, thus, developing within each child an awareness of the differences and similarities of both shapes.

Materials: Cardboard templets all of the same size and color in a variety of shapes. Form recognition test sheet which can be used to test the material learned during the lesson. Crayons and dittoed sheets containing outlines of a variety of geometric shapes.

Procedure: Environment

The learning environment should be free from all extraneous matter so that the children can concentrate on the shapes themselves. The templets used in this lesson should be of a variety of sizes.

Participation

Have a variety of geometric shapes already drawn on the blackboard, or have a collection of shapes---round, square, oblong, oval, and triangular--drawn on a sheet of poster board and displayed in a convenient location. The shapes should be represented by outlines. Dittoed sheets should be printed with a variety of geometric shapes. The sheets should be prepared before the actual lessons begin.

Encourage the children to discuss the way in which these shapes are made: the number of sides, and the length of the sides. Emphasize the differences as well as the similarities of all the shapes. Prime consideration in this lesson should be given to the actual shapes as they appear on the board, and/or sheets, not to real objects in the environment which have a particular shape which corresponds to those drawn. Perhaps several children in the group will have had special experience with one or more of the shapes. In this case allow them

to share their experience with the others in the group. After this discussion ask the children if they would like to fill in with crayon the shapes about which they have just talked.

After this discussion pass out the sheets of paper with dittoed shapes on them and allow the children to color the shapes in with a crayon. The children should be encouraged to fill the shape with color and stay between the lines. Verbally reward those children who stay within the lines* and help those who do not do so. Finally, discuss the shapes colored by the children.

Learning and Evaluation: Can the children name most of the shapes? Do they recognize the differences in the shapes? Do they show a preference for any one shape? Do they associate any shape with a color; that is, after a shape was colored red was it referred to as red or by its shape name? If the answer to the first part of this question is yes, maybe more work with neutral colored shapes is in order so that shape names can be learned with less confusion.

Lesson Two: Perceptual awareness of the circle.

Objective: Reinforcing the recognition of the circle by providing experience in drawing around templet circles and various geometric shapes.

Materials: Pre-cut cardboard templets in the shapes of circles, triangles, squares, ovals, rectangles, etc. in various sizes. Large sheets of paper, crayons and a good quality drawing paper approximately 18" x 24".

*It should be noted that the primary objective is related to development of circle/round concepts, and not a creative drawing or coloring lesson.

Procedure:

Environment

For this lesson the children can work on either the floor or large tables, whichever supplies enough space to move around freely. If the desks are chosen they should be placed in the middle of the room in an arrangement that allows each child easy access to all of the materials.

Participation

Before allowing the children to start, demonstrate the procedure for tracing around the forms. Discuss the procedure with the children and ask them for suggestions concerning how various patterns and especially circles could be drawn or arranged. Emphasis is placed upon the tactile quality of experience; i.e., "see how it feels to make a circle."

Show the children the templet shapes and discuss the different aspects of each; that is, the number of sides, color, etc. Ask them to guess what materials were used in each. Reward correct answers.

Motivate the children to perceptually observe the assorted shapes. Discuss the ways in which they are similar and then pass out the large sheets of white paper and crayons. Give each child the templet shapes and instruct them to trace around each one with their crayons. Allow the children to make as many outlines as they wish and encourage them to overlap and make designs with the circles as well as the other shapes.

As the children work, there should be a variety of designs made, of circles within circles, connecting circles, different sized circles and overlapping circles. The children should be developing the sensitivity toward and increasing awareness of the circle/round concept that the project, as a pure kinesthetic experience

can provide. Watch the class during the work period so that aid can be given to those who are experiencing difficulty with one or more of the tools or those who are at a loss for an idea of how to put down their thoughts.

Stress using a variety of different templets in order to enable them to understand the value of individual differences. Some circles can be filled in where others can be left blank or the areas around them filled in (negative area circles).

Learning and Evaluation: Can the children discriminate between shapes? Are they asking questions concerning the differences between shapes? Does their behavior indicate a need to repeat this lesson? Can they name all of the shapes? Do they refer to the shapes by name or by their color? Record the answers to these and other pertinent questions and use the answers as the basis for additional activities in areas of indicated need.

Lesson Three: Furthering knowledge of the circle configuration by comparing a variety of geometric shapes with emphasis given to the circle.

Objective: To further the children's knowledge of the circular configuration by matching a variety of geometric shapes with special emphasis given to the circle.

Materials: Construction paper pre-cut geometric shapes, paste and dittoed sheets with various shapes which correspond to the pre-cut shapes printed on them.

Procedure: <u>Environment</u>

Find a location in the room that is suitable for pasting. Small tables and chairs are best for this type of activity. Attempt to remove all extraneous matter from the learning environment.

Participation

Begin the lesson by discussing the similarity and the differences between each shape. Encourage the children to participate in the discussion. Most likely each child will have had experiences with all of the shapes.

Next show the children how the shapes can be matched and pasted on the dittoed sheets. Paste down a couple of shapes in order to give the children an example of the process. Pass out dittoed sheets with various geometric shapes represented and the construction paper shapes that correspond to those represented on the sheets. Ask the children to paste the construction paper shape directly over their corresponding shapes on the dittoed sheets. After the matching activity show the group the sheets with the forms on them. Ask the children to identify each shape on the dittoed sheet in front of them. The form sheets contain a few shapes with which many children simply will not be familiar.

All the children need to do is to verbally name each shape that was used during the lesson. If for some reason a few children do not recognize a few of the shapes, have them repeat the names after you.

Emphasize the circular shapes especially with regard to the ways in which they differ from more angular ones.

Learning and Evaluation:

Can the children name the shapes used in the lesson? Do their comments indicate a need for similar lessons? Did the children match the shapes correctly?

Lesson Four: Becoming more familiar with geometric configurations, especially the circle, by sorting and classifying them.

Objective: To assist the children in becoming familiar enough with various geometric shapes, thus, enabling them to sort and classify these shapes.

Materials: Cardboard templets (different colors) representing a variety of geometric shapes such as: square, circle, (use a variety of sizes of circles, triangles, rectangle, oval, etc.) A sufficient number of shapes should be supplied so that each child can work separately during sorting.

Procedure:

Environment

Find a section in the room that will furnish enough space for each child's sorting activities.

Participation

Before starting the sorting and classification of shapes discuss the similar as well as dissimilar qualities of each of the shapes. This can best be done by holding up each shape simultaneously with one of having different properties.

Ask the children to explain how they are alike and how they are different.

It might also be beneficial to have a few of the children go up to the blackboard and draw the two shapes and then have the class comment on the aspects of the chalk drawings as well as the original shapes.

Pass out the shapes to be sorted to each child. Instruct them to put all of the shapes that are alike together.

During the sorting procedure the teacher should walk around in the learning environment in order to assist those children who are having difficulty with sorting.

Learning and Evaluation: Were the children able to sort the shapes? If some children are having difficulty with some shapes is there any new exercise with shapes that could be tried? Are the children sometimes confused by the different colors of templets? Would it be beneficial to repeat the lesson using all shapes of one color?

Lesson Five: Increasing the orientation to geometric configurations, with emphasis on the circle, by duplicating a variety of shapes.

Objective: To be able to use a crayon to duplicate a variety of geometric shapes with special emphasis given to the circle.

Materials: Dittoed sheets containing a series of geometric shapes, crayons. The dittoed sheets should have sufficient space left at the side of each configuration in which the child can copy each shape.

Procedure:

Environment

Choose an area of the room that furnishes each child sufficient room in which to copy the shapes.

Participation

Show the children the dittoed sheets containing a circle, cross, square, and other geometric shapes and ask them to copy each shape in the space adjacent to them.

Be careful not to draw around the figure in pantomine or to give the child any indication by gesture of the movement made in drawing. If the child asks what the figure is, give him its

geometric name; concentrate attention on the circular shape by contrasting it to the others and by including more circles as shapes to be copied.

After the drawings are complete go over the names of the shapes with the children once more and allow the class to make comments about some of the shapes that have been drawn by the other individuals. Encourage those children who finish ahead of the others to fill in the shapes with crayon.

Learning and Evaluation: Do the children's drawings indicate an understanding of the configurations; that is, do they include the correct number of sides, points, etc.? Can they assign the appropriate name to each shape?

Experimental Group[1]

Lesson One: Introducing the circle/round concept through a 35 mm slide presentation and a creative collage* building exercise.

Objective: To introduce the children to the circle configuration through 35 mm color slides and to give the children an opportunity to cut and manipulate circular materials of varying textures, and colors, and to fix them on a background.

Materials: Swatches and samples of textured papers, fabric, scraps, leather, paper, buttons, etc., in a large box that will invite browsing.

Heavy stock paper 12" x 18". Enough paper panels should be prepared for each child to make several texture compositions if he wishes. 35 mm color slides depicting the circle schema utilizing a number of variations and combinations of other shapes. The slides should contain a variety of circle configurations which include a number of different colors as well as circular objects

*A collage is a form of low relief made by pasting an array of objects or parts of objects on a flat surface creating an unique expression.

[1]These materials were developed by Michael Andrews. We appreciate his willingness to permit us to use them in the present project.

of assorted sizes and combinations of such shapes both in and out of focus. A 35 mm slide projector.

Procedure:

Environment

A display of large graphic circles, similar to the ones in the slides placed randomly in the learning environment may stimulate the children more completely and in general provide an environment which is most conducive to developing an awareness of circle/round. The posters should be hung at the eye level of the four-year-olds. These posters may also be used for reference by the children after the slides have been shown. Collected works by children and others, including professional artists should be considered. Examples should be chosen for free textural and color content. Have the children work on tot-sized tables that can be moved together and covered with newspaper and used as a working area. Place the box of materials within easy reach of all.

Participation

After the slides have been shown discuss the circular configurations that were seen in them with special emphasis on the experiences the children have had with such objects. Motivate the children to touch and observe the collage examples hanging in the learning environment.

Explain that they too will be able to make pictures to see and touch. Young children are eager to become involved in activities such as these. The teacher can support them most effectively by permitting them to proceed and by following their leads so as to know when, where, and how to help. Allow the children to explore the materials box for interesting textures, colors,

and shapes. Ask them - Which pieces are bumpy? Which are soft? Demonstrate the use of contact paper to combine textures in interesting ways (making a picture). Allow each child to work at his individual rate. Motivate each child individually, asking the child to describe his choices and support his selections: "What beautiful fuzzy blue! "

Help him to appreciate his selections and compositions both tactiley and visually. Stress the diversity of approaches that can be used. During the lesson reserve an area of one wall which can be used for the showing of the circle/round slides. Use these slides as additional stimulation during construction.

Learning and Evaluation: Are the children involved in a combining process? Have they been supplied with a diverse variety of circle/round materials? Are they demonstrating sensitivity and selectivity in finding materials? What other awarenesses are involved? Composition of space? color? line? shape? Is there an interest in circle/round composition? Are the children contributing, seeking and sharing materials of many kinds?

Lesson Two: Furthering the children's understanding and expanding their notion of circle/round by using tempera paint to establish original schema based on the circle.

Objective: To build within the children the ability to synthesize, or recognize the circle as being part of various other configurations: e.g., wheel - car, head - person, tail - rabbit, and the like. The approach that will be used is that of elaboration of a circle.

Materials: Shallow pans of paint (pie pans or emptied, small milk cartons with the tops pulled up), at least ten colors of tempera paint of varying consistencies (thick to thin), newspapers to cover

the floor and tables, smocks for the children, and sponges. Large sheets of colored poster board which can be used to fill the environemnt with abstract color. 35 mm slide projector, and slides of abstract, circular configurations.

Procedure:

Environment

Several tables in the room can be moved together and covered with newspaper to form a working area. The best place to move the tables is near the middle of the room at a location somewhat isolated from the toys present. With tables in the center of the room the children will not have difficulty in negotiating the entire working area. This aspect of the experience will be important as each child is to reach a particular container of paint when he needs it.

Ordinary pie pans make very good paint containers because of their shape emphasizes the paint instead of the material of the container. Fill these shallow containers to the top with colors such as: yellow, red, blue, orange, green, violet, black and white.

The paint used for this experience should be of varying consistencies, that is, some thick, some thin, and still others watery. Attempt to place the containers so that not all paint of equal consistency is placed in the same area.

Place several pieces of colored poster board around the room in an abstract manner. This procedure will be especially appropriate to stimulate the children's interest in color during the lesson.

Participation

Dress the children in their smocks. Before the teacher passes out the sheets of paper 18" x 24" on which the children are to paint she should paint a circle on each page three or four inches in diameter. This shape will be used as the starting point by each child. Next pass out the paper and encourage the children to explore the paint in front of them. Probably the only encouragement they will need is to be exposed to the paint. Ask the children to try to make the circle into something, a picture of their own. Perhaps some of them will make an animal, design, scene, themselves, a rabbit, bicycle, etc. Encourage them to elaborate on the original circle. By elaboration here, it is meant to use many different colors and make as complex a painting as possible.

Many children will probably be ready to finish in a very short time. Attempt to motivate them to commit themselves to the task by encouraging them to fill the page; to try new colors; to make more lines, etc.

Learning and Evaluation:

Are the children using paint as an expressive media? Did they elaborate on the original circle? Did they use the circle as an integral part of their finished painting? Have you stimulated the children's curiosity and interest relative to line and color? Do you feel that it would be beneficial to repeat the lesson? Have the children inquired about other kinds of painting materials? Are there other types of lessons you can use which require elaboration?

Lesson Three: Increasing the circle/round orientation through the showing of a movie and providing for the investigation of the relationship between physical body motions and the concepts of circle/round.

Objective: To involve the children in an exercise that illustrates the motion qualities of circle/round. After this lesson the children should realize that the concept of round includes the aspect of motion.

Materials: Two super 8mm movies in cassette form of various kinetic activities and other types of simple and complex circular configurations involving motion. One super 8 cassette movie projector, carpeting or mats which will serve as the surface on which the exercise will be conducted. Materials used in the movie should be present so that the children can gain first hand experience by using them.

Procedure:

Environment

Set up the movie projector in an area of the room which facilitates easy viewing by all the children. It is not necessary to use a movie screen if there is a white wall nearby. In order to provide a more stimulating environment large designs represented on poster board should be placed at various points in the learning environment. The same posters that were used in the first lesson might be appropriate for this lesson.

Participation

Begin the lesson by showing the circle/round movie #1.* During the movie encourage the children to respond freely. Stimulate

*The materials used in this movie are: small tractor, bottle tops, coins, buttons, hub caps, compass, bull's-eye, drill and a top.

them to offer experiences of their own relative to the materials used in the movie.

After the movie ask the children if they would like to play with the circular shapes that were in the film and make circles of their own. Introduce the shapes that were used in the film. Encourage the children to experiment with the materials. After they have thoroughly manipulated the materials, involve them in tumbling exercises. This is an important aspect of circle/round concept; namely, because motion plays an integral part in this concept. It also serves to involve the children kinetically with the concept. Involve the children in activities such as turning summersaults, spinning, rolling, circular movements of arms, legs, finger, hands, etc. Play a game. Ask the children to see how many different ways they can use their bodies to make round. This usually stimulates some children's creativity and enriches the experience of all the children.

Learning and Evaluation: Were the children exposed to a diverse group of kinetic activities? Did they become sufficiently involved during the lesson? What kinds of aesthetic sensitivities are developing? Are the children demonstrating an increased awareness of the circle/round concept?

Lesson Four: Investigating the aspect of motion in the circle/round concept by the use of a movie and giving the children an opportunity to construct things that move on wheels with tinker toys.

Objective: To examine that aspect of circle/round that involves motion by viewing a movie and constructing things that roll with tinker toys.

Materials: Circle/round movie in cassette form which contains a sequence of tinker toys in motion, cassette projector, large set of tinker toys (350 pieces), Polaroid camera, and one roll of black and white film (which can be used to take pictures of structures for discussion after the lesson).

Procedure:

Environment

The teacher's task in setting up the environment for this lesson is much the same as it would be when setting up an environment for any learning situation. She should provide a setting where the children are invited to make choices relative to the kinds of tinker toy shapes they wish to use after viewing the movie. The materials should be dispersed so that many alternative choices are possible within the structure of the lesson.

The teacher must design the setting to accommodate this young child's way of learning by providing divergent types of materials, in this case, a variety of tinker toy shapes.

Arrange the tables or use a part of the floor that will insure discovery of all materials.

Participation

Begin the lesson by showing the circle/round movie. Encourage the children to make comments during the showing of the movie.

After the movie discuss all of the various things that roll on wheels, e.g., trucks, cars, wheel barrels, roller skates, wagons, etc. During this discussion emphasize with objects with which they have probably had experience.

In short, begin with what the children seem to know and gradually lead them on from there, adding to and clarifying those ideas that seem unclear, or distorted. After the discussion ask them to use the tinker toys to make as many things as they can that move on wheels. Emphasize the importance of round when speaking about the wheels.

As the structures are made choose eight of them and make photographs of them. Use these pictures for further discussion after the building period. An even better procedure is to allow the children to take the pictures. Once the camera is set, a Polaroid picture is relatively easy to take. Give the children a chance to take the pictures. This promotes even more interest.

Learning and Evaluation: Did the children learn to use the discussion as the basis for their constructions? Do they understand round in terms of what it contributes to the rolling function of the wheel?

Lesson Five: Furthering the understanding of the circle/round concept through exposure to a printing experience which utilizes kenetic involvement by the children.

Objective: To get the children involved with the printing of circular shapes in order that they might discover that circles can vary in coolr, size, and subtleties of shapes, and that by overlapping them elaborate designs can be made.

Materials: Sometime before the lesson is planned ask the children to bring a round object from home with which they can paint. Shallow pans, tempera paint (thicker than normal consistency), red, yellow, blue, orange, pink, violet, green, etc. A variety

of circular configurations such as spheres, disks, and cylindrical shaped objects. The objects that can be used for this lesson are sponges, corduroy, styrofoam balls, jars, dowel rods, bottle caps, and the like, or any other kind of object that the children bring from home which is suitable for making impressions as circular printing objects.

Procedure:

Environment

The teachers' task, in planning a painting activity, becomes one of creating a conducive environment, supplying materials that are appropriate and convenient, and in motivating each child to explore, discover, create, control, and express individual interests.

The environment should be free from all extraneous matter so that the children can concentrate on paint as a material which they can use to explore the concept of circle/round. Provide many colors of paint for this experience. This will make it easier for the children to react during the experience by painting pictures with greater elaboration.

Several tables can be pushed together and covered with newspaper and used as a working area. It is not necessary to emphasize the printing process during the lesson because the emphasis in the lesson is not on making anything, but rather to furnish an opportunity for each child to interact and work with paint and round configurations. The newspaper in front of each child can be used to smear, and try out various shapes with the paint. Paint, is naturally, a material that lends itself for use in drawing. When paint and anything else are presented together they almost require the user to draw. The

children may wish to draw with the objects but emphasis should remain on the circle as a point of departure.

Participation

Allow the children to share the materials which they brought from home. Discuss each one of the objects.

Dress the children in smocks before they begin to experiment with the printing objects. Encourage the children to investigate many different approaches of using the objects with great commitment; that is, motivate the children to manipulate the objects, turn them around and paint with them from many different angles. Allow the children to print individually at first and later in groups. Many children will naturally begin to use the paint to express an idea or experience. Others will concentrate on the paint itself by manipulating it in their hands. Ask questions such as: How do the objects feel to you? Are they cold or hot? How many different designs can you make with it (any object)? Can you mix the colors of paint together and then print with them? Can you use the paint and your hands to make circles? Emphasize the fact that the paint will mix. Motivate the children to mix the paints both on the newspapers in front of them and in the pans. Encourage the children to comment about what they are doing. Attempt to obtain from this experience the greatest interplay of child and paint by giving each child a chance to personally interact with both objects and paint. The really creative teacher will encourage the children to try new approaches. Ask the children to attempt to overlap one circle over another. Show them that

some objects can be rolled over puddles of paint left standing on their paper in order to create still new variations. Accidents and messes will occur during the painting experience even in the best organized classroom. These provide learning experience when children are given a share of responsibility for cleaning up. Allow the children to participate in clean up.

Learning and Evaluation:

Did this experience act as a means to sensitize the childrne to the concept of round? Are the children playing with paint or are they using it as an expressive media? Have we stimulated the child's curiosity and interest in printing with circles? Do the children inquire about other kinds of materials which can be used for printing? Do you feel that additional printing experiences are warranted? Are the children learning to make maore elaborate designs by using the principle of overlapping?